Lec : Cranial Nerves IX, X, XI, XII

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Glossopharyngeal Nerve (IX)

- Mixed nerve

- Originate from medulla (between olive & inferior cerebellar peduncle) → Jugular foramen

Motor Modalities
- Motor fibers originate from the medulla
  - SVE Innervate the stylopharyngeus muscle
  - GVE Parasympathetic motor neurons via otic ganglion innervate parotid gland
- Major motor function is regulation of secretion of saliva

**from its name (glossopharyngeal) mainly for tongue and pharynx**

**exit anteriorly from brainstem mainly from post olivary sulcus and goes anteriorly toward jugular foramen exiting from it with vagus and accessory nerve**

(remember jugular foramen located in posterior cranial fossa posterior to petrous portion of temporal bone)

**SVE to Innervate the stylopharyngeus muscle(which has function of elevating the pharynx)**

**again we have preganglionic and postganglionic ,,the postganglionic will be in ganglia we call in otic ganglion in the infratemporal fossa posterior to parotid gland ""its own function to innervates the parotid gland for salivation""**

Sensory Modalities
- Sensory fibers originate from:
  - GSA – superior ganglion – external ear
  - GVA – inferior ganglion
- The pharynx & posterior ⅓ of tongue
- Carotid sinus baroreceptors
- Carotid body chemoreceptors
• SVA Taste buds of the posterior third of the tongue (taste) – inferior ganglion

**as you can not remember 😊 we have talked about auricular branch of glossopharyngeal nerve and others nerves supplying external and middle ear

**we also talked about tongue and how the anterior 2/3 receive general somatic afferent from trigeminal nerve and special visceral afferent from facial nerve in contrast with posterior one third which receive special and general visceral from glossopharyngeal nerve

**once IX nerve exit from jugular foramen >> it will give superior ganglion and inferior ganglion the superior one responsible for GSA ,, and inferior one give GVE and SVA

Glossopharyngeal Nerve Nuclei
• Main motor nucleus (SVE) (nucleus ambiguus)
• Location
• Connections – cortex
• Parasympathetic nucleus (GVE) (inferior salivatory nucleus)
• Connections – hypothalamus
• Sensory nucleus (nucleus of the tractus solitarius) (SVA, GVA)

**nucleus ambiguus its a large nucleus in upper part of medulla oblongata ..gives SVE for IX & X
Thats large nucleus receive bilateral connection from cortex (thats mean if u have a cut in one ,there will be no effect cuz its bilateral)

**Parasympathetic nucleus>> GVE from inferior salivatory nucleus,, this nucleus located posterior to nucleus ambiguus in the upper medulla oblongata
again we have talked about superior salivatory nucleus for facial nerve , but inferior one for glossopharyngeal nerve

Glossopharyngeal Nerve (IX): Branches
• Tympanic n. → tympanic plexus (tympanic cavity)→ lesser petrosal n. →
fissure between petrous portion & greater wing of sphenoid → otic ganglion

- Carotid sinus n.
- Nerve to stylopharyngeus m.
- Pharyngeal branches → pharyngeal plexus*
- Lingual branch

*Contains fibers from:
IX – sensory
X – motor
sympathetic – vasomotor

**Glossopharyngeal nerve exit from jugular foramen ,,gives superior and inferior ganglion.

-- tympanic plexus (GVA for mucous membrane of middle ear)

**lesser petrosal nerve goes toward otic ganglion which located posterior to parotid gland ,, from there posterior ganglion nerve goes to parotid gland and supplying it

-note that "" greater petrosal nerve from facial nerve (parasympathetic for lacrimal gland ),,, deep petrosal nerve from the internal carotid plexus ,,it carries( postsynaptic sympathetic nerve fibers to the pterygopalatine ganglion)"

** Glossopharyngeal Nerve supply sensory receptors of carotid body

**also Nerve to stylopharyngeus muscle

**pharyngeal plexus(which mixed of vagus and glossopharyngeal nerve) responsible for innervation of pharynx

--also doctor said note that point ( nasopharynx receive sensation from trigeminal nerve)

Glossopharyngeal Nerve (IX): Lesion

- Loss of gag reflex (afferent limb) " efferent limb from vagus nerve""

- Hypersensitive carotid sinus reflex (syncope)

- Loss of general sensation in the oropharynx

- Loss of taste from posterior ⅓ if the tongue
• Glossopharyngeal neuralgia

--any injury to IX nerve we suspect problem to posterior one third of tongue (general visceral and taste ) ,, pharynx ,, middle ear ,, parotid gland

--gag reflex :: contraction of the back of the throat, evoked by touching the roof of the mouth, the back of the tongue, the area around the tonsils, and the uvula, ,, so if you have a problem in this nerve there is no gag reflex evoked by touching uvula

Glossopharyngeal neuralgia is an irritation of the ninth cranial nerve(by inflammation , tumor or injury) causing extreme pain in the back of the throat, tongue and ear

you feel like severe pain when you attempt to swallowing

neuralgia as problem noticed mainly in trigeminal nerve,, cuz that nerve innervate most of face ,so when air toch your face, you feel pain from it

vagus nerve

• Mixed cranial nerve
• Widely distributed from the head and neck into the thorax and abdomen
Motor Modalities
• Motor fibers originate from medulla
• SVE Muscles in the respiratory passageways
• GVE Lungs, heart, esophagus, stomach, small intestine, most of the large intestine and the gallbladder
• Glands of the gastrointestinal tract

**the only one nerve that exceeded head and neck region and go down supplying thorax and abdomen

**Again it passes from jugular foramen ,,giving superior and inferior ganglion

**SVE Muscles in the respiratory passageways: skeletal muscle for pharynx and larynx
**GVE mainly for smooth muscle of Lungs, heart, esophagus, stomach, small intestine, most of the large intestine 2/3**

**Sensory Modalities**

- Sensory fibers travel from:
  - **GVA** (from abdomen, thorax, up to the laryngopharynx) Visceral sensory receptors of thoracic and abdominal organs – inferior nodose ganglion
  - **GSA** (small part from external auditory canal) The ear – superior jugular ganglion
  - **SVA** Some taste buds (on epiglottis) – inferior nodose ganglion

GSA go to sup. Ganglion then to trigeminal nuclei

GVA+SVA go to inf. Ganglion then centrally to tractus seritalis

**Vagus Nerve Nuclei**

- **Main motor nucleus (nucleus Ambiguous)** (glossopharyngeal the upper part + vagus the lower part) (SVE) vagus part for all pharyngeal muscles + laryngeal muscles with some exceptions .has connection with cortex

- **Parasympathetic nucleus (dorsal – dorsal located - nucleus of the vagus) (GVE)**

- **Location** (in medulla) lateral to hypoglossal nucleus posteriorly located has tripod in rhomboid fossa, it is very large nucleus because it will supply most viscera of the body have pre-ganglionic fibers, post-ganglionic fibers (because it is parasympathetic) it will be near to the wall of organs.

- **Connections - hypothalamus**

- **Sensory nucleus (nucleus of the tractus solitarius) (SVA, GVA)**

and GSA to trigeminal nucleus

all of them exiting from post-olivary sulcus then from jugular foramen with glossopharyngeal nerve

glossopharyngeal nerve end in upper part of cervical region but vagus n it will reach below the mandible pass through the carotid sheath (with carotid a + internal jugular vein) toward thorax + abdomen.
Vagus Nerve (X): Branches

- **Meningeal branch** (dura matter above tentorium cerebelli supplied by trigeminal + vagus)
- **Auricular branch** (external auditory canal)
- **Pharyngeal branches** → **pharyngeal plexus** (vagus (sensory for laryngopharynx + moto for all pharyngeal muscles) + glossopharyngeal (sensory for oropharynx))
- **Superior laryngeal n.** (mixed nerve)
- **Internal laryngeal n.** (sensory for upper part of larynx above vocal cord)
- **External laryngeal n.** (motor for cricothyroid muscles)
- **Recurrent laryngeal n.** – left (recurrent below the aorta-ligamentum arteriosum) & Right (recurrent on subclavian-in base of the neck) ....
  Recurrent laryngeal n. motor for all laryngeal m. + sensation in lower part ((mixed n.))
- **Inferior laryngeal n.**
- **Cardiac branches** → **cardiac plexus**

also it has pulmonary branches

Vagus Nerve (X): Lesion
(block for all visceral organs !!!!)
(larynx sensation, speech, pharynx, swallowing..............)
Sensation in external auditory canal by vagus nerve explain the gag reflex when you clean your ear sharply with cotton buds because vagus n also innervate the pharyngeal + laryngeal m.

- **Ipsilateral paralysis of the soft palate, pharynx, larynx mm.** – **dysphonia, dyspnea, dysarthria & dysphagia**
  - Inability to raise the palate
  - Hoarseness or loss of voice
- **Loss of gag reflex** (efferent limb)
  - Inability to generate the reflex upon touching the lateral pharyngeal wall
- **Anesthesia of pharynx & larynx**
Accessory Nerve (XI)
Has 2 parts: cranial root + spinal root

- Mixed nerve; primarily (mostly) motor
- Cranial root originates from medulla (between medulla & olive) in post-olivary sulcus
- Joins Vagus nerve
  SVE of vagus n. (for pharyngeal + laryngeal m.) the origin of it is the cranial root of accessory n. (cranial root of accessory n. part vagus n.)
- Innervates the skeletal muscles of the pharynx, larynx, and soft palate that are used in swallowing

Accessory Nerve (XI) = Spinal root
- Spinal root (SVE) originates in the anterior gray horn of the first five segments of the cervical spinal cord; (like the motor nuclei in ant. Horn of the spinal nerves)
- The fibers converge (composition of Accessory Nerve) → foramen Magnum (toward cranial cavity) → then exit from jugular foramen
- SVE Innervates the sternocleidomastoid and trapezius muscles to coordinate head movements

Accessory Nerve (XI): Lesions ((IN Spinal root))
- Difficult moving the head
- Shoulder droop

Accessory Nerve Nuclei
- Cranial root (SVE)
- Nucleus ambiguus
- Join vagus outside the skull
Spinal root (SVE)  
Spinal nucleus FROM (anterior horn C1—C5)  
Connection – cortex (it is a cranial n. so the connection is bilaterally)  
Fibers course  
From SC – between the roots of spinal nerves

Hypoglossal Nerve (XII)

Simple n. the modality mostly GSE innervate the all tongue muscles (intrinsic + extrinsic m.)

hypoglossal nucleus located in medulla oblongata (in most medial dorsal part ) reflection
hypoglossal trigon on the floor of the rhomboid fossa ,fibers exiting from the pre-olivary sulcus leave the cranial fossa from the hypoglossal canal toward the cervical region toward
floor of the mouth just above the mylohyoid m. innervated the tongue.

Part of C1 n. fibers will join to hypoglossal n. and other part contribute in forming of ansa cervicalis (which is a part of cervical plexus

the hypoglossal has important relations with carotid a. (superficial to external carotid a.)

remember that: the glossopharyngeal n. superficial to internal carotid a a
branch of carotid a (posterior-occipital )hypoglossal n. inferior to it

Mixed, primarily motor
Originates from medulla (between pyramid & olive)
Exit through the hypoglossal canal
Controls muscles of tongue during speech and swallowing

Hypoglossal Nerve (XII): Injury
Atrophy in tongue m.
Injury deviates tongue to injured side when protruded

in pic in slid the lesion was in left hypoglossal n. (ipsilateral)

Hypoglossal Nucleus

Hypoglossal nucleus (GSE)
From ant. Part of brain stem (pre-olivary sulcus)
Location - 4th ventricle
• Connections – cortex (bilaterally)
• Fibers course

Best of luck